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SUGHRUE MION, PLLC  
2100 Pennsylvania Avenue, NW  
Washington, DC 20037-3213

EXAMINER

YAMNITZKY, MARIE ROSE

ART UNIT PAPER NUMBER

1774

DATE MAILED: 08/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/995,814

Applicant(s)

DOI ET AL.

Examiner

Marie R. Yamnitzky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2004 and 03 February 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's amendments filed on November 03, 2004 and February 03, 2005 have been entered.

2. The amendment filed November 03, 2004 amends claims 3, 5 and 23.

The amendment filed February 03, 2005 amends claim 1.

Claims 1-27 are pending.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. The rejection of claim 23 under 35 U.S.C. 112, 1<sup>st</sup> paragraph, as set forth in the Office action mailed May 03, 2004, is overcome by applicant's amendment filed November 03, 2004.

The rejection of claims 3 and 5 under 35 U.S.C. 112, 2<sup>nd</sup> paragraph is overcome by the November 03<sup>rd</sup> amendment.

The rejection of claims 1, 2, 4 and 6-27 under 35 U.S.C. 103(a) as unpatentable over Woo et al. (US 6,169,163 B1) is overcome by applicant's amendment filed February 03, 2005.

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4. Claims 1-3 and 6-27 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

For claims 1-3 and 6-27, Ar<sub>2</sub> of formula (8) may represent any arylene group or divalent heterocyclic compound group other than a group represented by formulae (2) to (7). The narrowing of the scope of groups represented by formulae (2) to (7) as defined in claim 1 has the effect of broadening the scope of Ar<sub>2</sub> since the possibilities excluded for Ar<sub>2</sub> are now less than originally disclosed. Ar<sub>2</sub> as defined in present claim 1, with claims 2, 3 and 6-27 dependent therefrom, is broader than originally disclosed, and the polymeric fluorescent substance defined in claim 1, with claims 2, 3 and 6-27 dependent therefrom, encompasses polymers outside the scope of the original disclosure. (For example, a polymeric fluorescent substance having repeating units of formulae (1) and (8) wherein Ar<sub>2</sub> represents a divalent benzofuran, benzothiophene or benzimidazole group is within the scope of present claim 1, with claims 2, 3 and 6-27 dependent therefrom, but outside the scope of the original disclosure because divalent benzofuran, benzothiophene and benzimidazole groups were within the scope of formulae (2)-(6) as originally defined. )

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5. Claims 1-27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The two lines preceding formula (8) in claim 1 include the phrase "at least one of  $R_3$  to  $R_{30}$  is an alkoxyphenyl group". In this phrase, -- $R_{22}$  and-- should be inserted after "to" because the variables  $R_{23}$  to  $R_{29}$  are no longer possible in formulae (2) to (7).

Since claim 1 requires at least one of  $R_3$  to [ $R_{22}$  and]  $R_{30}$  to be an alkoxyphenyl group,  $Ar_1$  in formula (1) must have at least one alkoxyphenyl group as a substituent. Claim 2 recites " $Ar_1$ ...has one or more substituents selected from alkylphenyl...". It is not clear if the one or more substituents required by claim 2, which are not limited to alkoxyphenyl groups, are in addition to the at least one alkoxyphenyl group required by claim 1, or if claim 2 fails to properly further limit claim 1. If the latter, claim 2 should be cancelled. (If claim 2 is cancelled, the dependency of claims 3-7 will need to be corrected, and claims 18-27 will need to be cancelled or amended to change claim dependency.)

Similarly, claims 3 and 5 define various possibilities for  $R_1'$  and  $R_2'$ , but at least one must be alkoxyphenyl in order for claims 3 and 5 to properly further limit claims 1 and 2.

6. Claims 1-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shi et al. (US 6,361,887 B1).

Shi et al. disclose fluorescent polymers comprising one or more repeating units similar to units of formula (1) and one or more repeating units of formula (8) as defined in present claim 1,

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wherein  $Ar_1$  is similar to the group represented by formula (4) as defined in claim 1 wherein  $X_5$  is  $-CR_{21}=CR_{22}-$  and  $X_6$  is  $-CR_{30}=$ , and similar to the group represented by formula (1') as defined in claim 3. Shi et al. disclose electroluminescent (EL) devices wherein the fluorescent polymer is disposed between an anode and a cathode. For example, see the abstract, column 37, line 57-c. 38, l. 55 and the claims.

Among polymers 1-198 having the formulae shown in columns 5-38 of Shi's patent are numerous polymers comprising a repeating unit of formula (1) wherein  $Ar_1$  is represented by formula (4) wherein  $X_5$  is  $-CR_{21}=CR_{22}-$  and  $R_{21}$  or  $R_{22}$  is an alkyl or alkoxy group. For example, the first naphthalene ring structure of polymer 2 is a divalent group represented by present formula (4) wherein  $R_{21}$  is an alkoxy group and the second naphthalene ring structure of polymer 2 is a divalent group represented by formula (4) wherein  $R_{22}$  is an alkoxy group.

Each of polymers 68-71 having the formula shown in columns 15-16 of Shi's patent comprises a repeating unit of formula (8) wherein  $Ar_2$  is represented by formula (2') as defined in present claim 4. (Note that the definitions of  $R_1$  to  $R_4$  as set forth in the first four lines of column 16 should apparently be set forth after the second formula spanning columns 15 and 16; compare to the second formula spanning columns 65 and 66 and accompanying definitions of  $R_1$  to  $R_4$ .) Polymers 68-71 comprise a repeating unit similar to units of present formula (1) wherein  $Ar_1$  is a group represented by present formula (4), and further represented by formula (1') as set forth in claim 3. In polymers 68 and 69, the naphthylene groups (the groups of present formulae (4) and (1')) are unsubstituted, whereas in polymer 70 the naphthylene groups are substituted by an alkyl group and in polymer 71 the naphthylene groups are substituted by an alkoxy group.

Shi's specific polymers differ from the polymers as defined in the present claims in that none of the specific polymers disclosed in the patent are polymers having units of formula (1) in which a naphthylene group ( $Ar_1$ ) contains an alkoxyphenyl group as a substituent. However, "substituted aryl" is among the possibilities for the substituents on the naphthylene groups of Shi's polymers and "4-methoxyphenyl" [sic] is among the preferences taught by Shi et al. See column 3, lines 22-40. (Shi's polymer 70 comprises an alkoxyphenyl group, 4-methoxyphenyl, as a substituent on the fluorenylene group instead of the naphthylene group.)

It would have been a *prima facie* obvious modification to one of ordinary skill in the art at the time of the invention to make polymers within Shi's guidelines other than the specific polymers disclosed by Shi in order to provide a variety of polymers suitable for use as a luminescent material in an EL device as taught by Shi. One of ordinary skill in the art would have reasonably expected substituted polymers containing substituents specifically taught by Shi et al., especially those containing the preferred substituents taught by Shi et al., to be suitable for use as a luminescent material in an EL device.

Shi et al. also do not explicitly disclose the polystyrene reduced number-average molecular weight of the polymers as required by the present claims. Shi et al. disclose weight average molecular weights. For example see c. 37, l. 27-31 and Table 1 in c. 54. It would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable and optimum number average molecular weights for Shi's fluorescent polymers based on properties affected by molecular weight.

Regarding present claims 6 and 7, the prior art discloses polymers similar to the polymers as defined in present claims 1 and 2, wherein the polymers have amounts of repeating units within the ranges set forth in claims 6 and 7. For example, in the aforementioned polymers 68-71, the total number of repeating units represented by formulae (1) and (8) is 100 mol% of all repeating units, and the amount of repeating units represented by formula (1) is 50 mol% based on the total amount of repeating units represented by formulae (1) and (8). Note that for claims 6 and 7, which depend from claim 1 or 2, there may be more than one repeating unit represented by formula (1) and more than one repeating unit represented by formula (8). In the prior art polymers such as polymers 68-71, both the divalent anthracenylene and the fluorenylene (or fluorenylenevinylene) units meet the limitations of a repeating unit represented by formula (8).

Devices having the layer structure specified in claim 8, with claims 11-13 dependent therefrom, and in claim 18, with claims 21-23 dependent therefrom, are disclosed by Shi et al. (e.g. see c. 37, l. 57- c. 38, l. 55).

Further with respect to present claims 9, 10, 19 and 20, it would have been within the level of ordinary skill in the art at the time of the invention to include auxiliary layers based on the properties afforded by those layers. The layers required by claims 9, 10, 19 and 20 are suggested by Shi et al. (e.g. see c. 38, l. 32-43).

Further with respect to present claims 14-17 and 24-27, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to utilize Shi's polymeric electroluminescent devices in articles which conventionally make use of electroluminescent devices.



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7. Claims 1-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noguchi et al. (EP 1 043 382 A2).

See the whole document, especially the claims and paragraphs [0014]-[0028], [0034] and [0042].

Noguchi et al. suggest polymeric fluorescent substances within the scope of the present claims.

The fourth and seventh formulae following “[Chemical formulae 9]” in paragraph [0019] suggest divalent groups represented by present formulae (6) and (7), respectively. The first, second, fifth and sixth formulae following “[Chemical formulae 10]” suggest divalent groups represented by present formulae (5), (2), (4) and (3), respectively.

The fifth formula following “[Chemical formulae 10]” further suggests a divalent group represented by formula (1') as defined in present claim 3.

The seventh formula following “[Chemical formulae 13]” suggests a divalent group represented by formula (2') as defined in present claim 4.

Noguchi et al. suggest the use of these polymeric fluorescent substances in polymer light emitting devices having the layer structures required by present claims 8-13 and 18-23. Noguchi et al. further suggest the use of polymer light emitting devices comprising these polymeric fluorescent substances in articles as claimed in present claims 14-17 and 24-27.

Regarding the requirement for at least one repeating unit comprising a naphthylene group substituted by at least one alkoxyphenyl group, such repeating units are suggested by the prior art. The fourth and seventh formulae following “[Chemical formulae 9]” in paragraph [0019]

and the first, second, fifth and sixth formulae following “[Chemical formulae 10]” are naphthylene groups. These naphthylene groups may be substituted by at least one alkoxyphenyl group such as when at least one of the R variables is an alkoxyphenyl group. As defined in paragraph [0020], R may represent an aryl group of 6 to 20 carbon atoms and as taught in paragraph [0042], an alkoxyphenyl group is an example of an aryl group of 6 to 20 carbon atoms.

Noguchi et al. do not disclose a specific example of a polymeric fluorescent substance meeting the limitations of the present claims, but suggest numerous polymers within the scope of the present claims. It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to make various polymeric fluorescent substances suggested by Noguchi et al. with the expectation that polymers comprising the divalent groups and substituted by the substituents specifically taught by Noguchi et al. would be fluorescent and would be suitable for the purposes suggested in the prior art.

8. Applicant’s arguments filed February 03, 2005 have been fully considered but they are not persuasive with respect to the rejection based on Shi et al. and the rejection based on Noguchi et al.

Applicant argues that both prior art references fail to teach an alkoxyphenyl group as a substituent, and that one of ordinary skill in the art would not have been motivated to modify the repeating units taught by Shi et al. or Noguchi et al. by substituting an alkoxyphenyl group.

The examiner respectfully disagrees. As noted in the rejections as set forth in this Office action, both prior art references disclose an alkoxyphenyl group as a possible substituent on a naphthylene group (each of formulae (2)-(7) as defined in present claim 1 representing a naphthylene group having at least one alkoxyphenyl substituent).

The examiner has also considered the data set forth in the specification and is of the position that the data do not demonstrate superior/unexpected results commensurate in scope with the present claims compared to the applied prior art. Polymeric fluorescent substances 4-7, 9, 10, 13 and 16-21 meet the limitations of the polymeric fluorescent substance of present claim 1. Polymeric fluorescent substances 6, 7, 10, 16 and 19-21 further meet the limitations of present claim 3. Polymeric fluorescent substance 13 is the only specific polymer disclosed in the present specification which meets the limitations of present claims 4 and 5. Polymers according to the present claims exhibit a range of fluorescent strengths as shown in Table 1, with polymeric fluorescent substance 13 exhibiting a greater fluorescent strength than exhibited by some polymers within the scope of the claims and greater than exhibited by some polymers outside the scope of the claims. However, the fluorescent strength exhibited by polymeric fluorescent substance 13 is also less than that exhibited by some polymers within the scope of claims and some polymers outside the scope of the claims. Comparing polymeric fluorescent substance 13 to the polymers taught by Shi et al., the examiner also notes that polymeric fluorescent substance 13 has a fluorescent peak wave-length in the range of blue light, and Shi desires to provide polymers capable of emitting blue light (e.g. see c. 2, l. 1-3 of the Shi patent).

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9. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

MRY  
August 04, 2005



MARIE YAMNITZKY  
PRIMARY EXAMINER

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